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United States Department of Agriculture,

BUREAU OF ENTOMOLOGY,

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THE BEDBUG.

(Cimex lectularius L.)

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The presence of the bedbug (fig. 1) in a house is not necessarily an indication of neglect or carelessness; for, little as the idea may be relished, this insect may often gain access in spite of the best of care and the adoption of all reasonable precautions. It is very apt to get

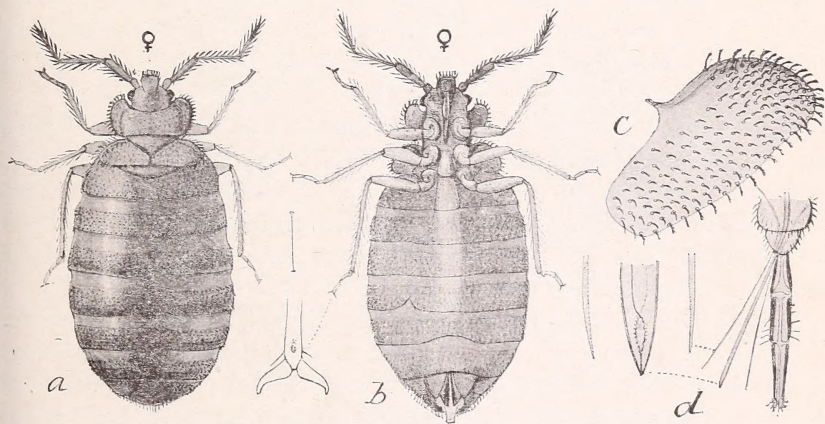


FIG. 1.—Bedbug (*Cimex lectularius*): *a*, adult female, gorged with blood; *b*, same from below; *c*, rudimentary wing pad; *d*, mouth parts. *a*, *b*, much enlarged; *c*, *d*, highly magnified (original).

into the trunks and satchels of travelers, and may thus be introduced into homes. Unfortunately, also, it is quite capable of migrating from one house to another and will often continue to come from an adjoining house, sometimes for a period of several months, gaining entrance daily. Such migration is especially apt to take place if the human inhabitants of an infested house leave it. With the failure of their usual source of food, the migratory instinct of the bedbugs is developed; and, escaping through windows, they pass along walls, water pipes, or gutters, and thus gain entrance into adjoining houses. In these or other ways it may be anyone's misfortune to have his premises temporarily invaded.

As with nearly all the insects associated with man, the bedbug has had the habits now characteristic of it as far back as the records run. It was undoubtedly of common occurrence in the dwellings of the ancient peoples of Asia. The Romans were well acquainted with it, giving it the name *Cimex*. It was supposed by Pliny (and this was doubtless the common belief among the Romans) to have medicinal properties, and it was recommended, among other things, as a specific for the bites of serpents. It is said to have been first introduced into England in 1503, but the references to it are of such a nature as to make it very probable that it had been there long before. Two hundred and fifty years later it was reported to be very abundant in the seaport towns, but was scarcely known inland.

One of the old English names was "wall-louse." It was afterwards very well known as the "chinch," which continued to be the common appellation for it until within a century or two and is still used in parts of this country. The origin of the name "bedbug" is not known, but it is such a descriptive one that it would seem to have been very naturally suggested. Almost everywhere there are local names for these parasites, as, for illustration, around Boston they are called "chintzes" and "chinchies," and from Baltimore comes the name "mahogany flat," while in New York they are styled "red coats."

The bedbug has accompanied man wherever he has gone. Vessels are almost sure to be infested with it. It is not especially limited by cold and is known to occur well north. It probably came to this country with the earliest colonists; at least Kalm, writing in 1748-49, stated that it was plentiful in the English colonies and in Canada, though unknown among the Indians.

The bedbug belongs to the order Hemiptera, which includes the true bugs or piercing insects, characterized by possessing a piercing and sucking beak. The bedbug is to man what the chinch bug is to grains or the squash bug to cucurbs. Like nearly all the insects parasitic on animals, however, it is degraded structurally, its parasitic nature and the slight necessity for extensive locomotion having resulted, after many ages, doubtless, in the loss of wings and the assumption of a comparatively simple structure. The wings are represented by the merest rudiments, barely recognizable pads, and the simple eyes or ocelli of most other true bugs are lacking. In form the bedbug is much flattened, obovate, and in color is rust red, with the abdomen more or less tinged with black. The absence of wings is a most fortunate circumstance, since otherwise there would be no safety from this pest, even for the most careful and thorough of housekeepers. Some slight variation in length of wing pads has been observed, but no individual with wings showing any considerable development has ever been found.

A closely allied species is a parasitic messmate in the nests of the common cliff or eaves swallow in this country, and it often happens that the nests of such birds are fairly alive with these vermin. The latter not infrequently gain access to houses and cause the housekeeper considerable alarm. At least three species occur also in England, all very closely resembling the bedbug. One of these is found in pigeon cotes, another in the nests of the English martin, and a third in places frequented by bats. What seems to be the true bedbug, or at best a mere variety, occurs occasionally in poultry houses.¹

The most characteristic feature of the insect is the very distinct and disagreeable odor which it exhales, an odor well known to all who have been familiar with it as the "buggy" odor. This odor is by no means limited to the bedbug, but is characteristic of most plant bugs also. The common chinch bug affecting small grains and the squash bugs all possess this odor, and it is quite as pungent with these plant-feeding forms as with the human parasite. The possession of this odor, dis-

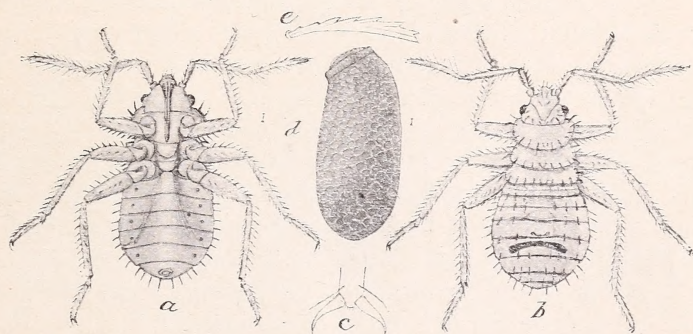


FIG. 2.—Bedbug (*Cimex lectularius*): Egg and newly hatched larva: *a*, larva from below; *b*, larva from above; *c*, claw; *d*, egg; *e*, hair or spine of larva. Greatly enlarged, natural size of larva and egg indicated by hair lines (original).

agreeable as it is, is, after all, a most fortunate circumstance, as it is of considerable assistance in detecting the presence of these vermin. The odor comes from glands, situated in various parts of the body, which secrete a clear, oily, volatile liquid. With the plant-feeding forms this odor is certainly a means of protection against insectivorous birds, rendering these insects obnoxious or distasteful to their feathered enemies. With the bedbug, on the other hand, it is probably an illustration of a very common phenomenon among animals, i. e., the persistence of a characteristic which is no longer of any especial value to the possessor. The natural enemies of true bugs, against which this odor serves as a means of protection, in the conditions under which the bedbug lives, are kept away from it; and the roach, which sometimes feeds on bedbugs, is evidently not deterred by the odor, while the common

¹Insect Life, Vol. VI, p. 166, Osborn.

house ant, which will also attack the bedbug, seems not to find this odor disagreeable.

The bedbug is thoroughly nocturnal in habits and displays a certain degree of wariness and caution, or intelligence, in its efforts at concealment during the day. It thrives particularly in filthy apartments and in old houses which are full of cracks and crevices in which it can conceal itself beyond easy reach. It usually leaves the bed at the approach of daylight to go into concealment either in cracks in the bedstead, if the latter be one of the old wooden variety, or behind wainscoting or under loose wall paper, in these places manifesting its gregarious habit by collecting in masses. The old-fashioned heavy wooden bedsteads are especially favorable for the concealment and multiplication of this insect, and the general use in later years of iron and brass bedsteads has very greatly facilitated its eradication. Bedbugs are not apt to be very active in winter, especially in cold rooms, and ordinarily hibernate in their places of concealment.

The bedbug, though normally feeding on human blood, seems to be able to subsist, for a time at least, on much simpler food; and, in fact, the evidence is pretty conclusive that it is able to get more or less sustenance from the juices of moistened wood, or the moisture in the accumulations of dust, etc., in crevices in flooring. No other explanation would seem to account for the fact that houses long unoccupied are found, on being reinhabited, to be thoroughly stocked with bedbugs.

There is a very prevalent belief among the old settlers in the West that this insect normally lives on dead or diseased cottonwood logs and is almost certain to be abundant in log houses of this wood. This belief was recently voiced by Capt. S. M. Swigert, U. S. A., who reports that it often occurs in numbers under the bark of dead trees of cottonwood (*Populus monilifera*), especially along the Big and Little Horn rivers in Montana.

The origin of this misconception—for such it is, so far as the out-of-door occurrence is concerned—is probably, as pointed out by Professor Riley, from a confusion of the bedbug with the immature stages of an entirely distinct insect (*Aradus* sp.) which somewhat resembles the former and often occurs under cottonwood bark. In houses, green or moist cottonwood logs or lumber may actually furnish sustenance to the bedbug in the absence of its usual food. The bedbug is, however, known to be able to survive for long periods without food, specimens having been kept for a year in a sealed vial, with absolutely no means of sustenance whatever, and in unoccupied houses it can undoubtedly undergo fasts of extreme length. Individuals obtained from eggs have been kept in small sealed vials in this office for several months, remaining active and sprightly in spite of the fact that they had never taken any nourishment whatever.

Extraordinary stories are current of the remarkable intelligence of this insect in circumventing various efforts to prevent its gaining access to beds. Most of these are undoubtedly exaggerations, but the inherited experience of many centuries of companionship with man, during which the bedbug has always found its host an active enemy, has resulted in a knowledge of the habits of the human animal and a facility of concealment, particularly as evidenced by its abandoning beds and often going to distant quarters for protection and hiding during daylight, which indicate considerable apparent intelligence.

The bite of the bedbug is decidedly poisonous to some individuals, resulting in a slight swelling and disagreeable inflammation. To such persons the presence of bedbugs is sufficient to cause the greatest uneasiness, if not to put sleep and rest entirely out of the question. With others, however, who are less sensitive, the presence of the bugs may not be recognized at all, and, except for the occasional staining of

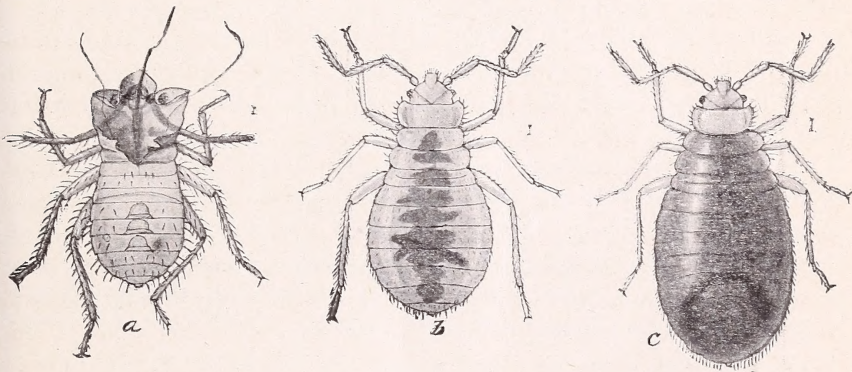


FIG. 3.—Bedbug (*Cimex lectularius*): a, larval skin shed at first molt; b, second larval stage taken immediately after emerging from a; c, same after first meal, distended with blood. Greatly enlarged (original).

the linen by a crushed individual, their presence might be entirely overlooked. The inflammation experienced by sensitive persons seems to result merely from the puncture of the skin by the sharp piercing setæ which constitute the puncturing element of the mouth parts, as there seems to be no secretion of poison other than the natural fluids of the mouth.

The biting organ of the bedbug is exactly like that of other hemipterous insects. It consists of a rather heavy, fleshy under lip (the only part ordinarily seen in examining the insect), within which lie four thread-like hard filaments or setæ which glide over each other with an alternating motion and pierce the flesh. The blood is drawn up through the beak, which is closely applied to the point of puncture, and the alternating motion of the setæ in the flesh causes the blood to flow more freely. The details of the structure of the beak are shown in figure 1 at d. In common with other insects which attack man, it is entirely possible for these pests to be transmitters of contagious diseases.

Like its allies, the bedbug undergoes an incomplete metamorphosis, the young being very similar to their parents in appearance, structure, and habit. The eggs (fig. 2, *d*) are white oval objects, having a little projecting rim around one edge, and are laid in batches of from one-half dozen to fifty in cracks and crevices where the bugs go for concealment. The eggs hatch in a week or ten days, and the young escape by pushing the lid within the projecting rim from the shell. At first the larvæ are yellowish white, nearly transparent, the brown color of the more mature insect increasing with the later molts (fig. 3). During the course of development the skin is shed five times, and with the last molt the minute wing pads characteristic of the adult insect make their appearance. A period of about eleven weeks has been supposed to be necessary for the complete maturity of this insect, but we have found this period subject to great variation, depending on warmth and food supply. Breeding experiments conducted at this office indicate, under most favorable conditions, a period averaging eight days between moltings and between the laying of the eggs and their hatching, giving about seven weeks as the period from egg to adult insect. Some individuals under the same conditions, however, will remain two to three weeks between moltings; and without food, as already shown, they may remain unchanged for an indefinite time. Ordinarily but one meal is taken between molts, so that each bedbug must puncture its host five times before becoming mature and at least once afterwards before it again develops eggs. Bedbugs are said to lay several batches of eggs during the season and are extremely prolific, as occasionally realized by the housekeeper, to her chagrin and embarrassment.

REMEDIES.

That the bedbug may be destroyed in houses by fumigating with hydrocyanic-acid gas has been fully demonstrated during the last few years. The gas penetrates every crevice in the house or room where the bedbugs conceal themselves and has an immediate effectiveness which gives it an important recommendation, especially when the infestation is considerable or of long standing. The gas treatment for houses is described in full by Dr. L. O. Howard in Circular 46 of this series.

The old remedies, which follow, are effective enough, though at a greater cost of time and personal effort, yet will often be of service for slight infestation or where the employment of the more poisonous cyanide is objected to or is impracticable.

The bedbug, on account of its habits of concealment, is usually beyond the reach of powders, and the ordinary insect powders, such as pyrethrum, are of practically no avail against it. If iron or brass bedsteads are used, the eradication of the insect is comparatively easy. With large wooden bedsteads, furnishing many cracks and crevices into

which the bugs can force their flat, thin bodies, extermination becomes a matter of considerable difficulty. The most practicable way to effect this end is by very liberal applications of benzine or kerosene or any other of the petroleum oils. These must be introduced into all crevices with small brushes or feathers or by injecting with small syringes. Corrosive sublimate is also of value, and oil of turpentine may be used in the same way. The liberal use of hot water, wherever it may be employed without danger to furniture, etc., is also an effectual method of destroying both eggs and active bugs. Various bedbug remedies and mixtures are for sale, most of them containing one or another of the ingredients mentioned, and these are frequently of value. The great desideratum, however, in a case of this kind, is a daily inspection of beds and bedding and of all crevices and locations about the premises where these vermin may have gone for concealment. A vigorous campaign should, in the course of a week or so at the outside, result in the extermination of this very obnoxious and embarrassing pest.

In the case of rooms containing books, or where liquid applications are inadvisable, a thorough fumigation with brimstone is, on the authority of the late Dr. J. A. Lintner, then New York State entomologist, an effective means of destruction. He says:

Place in the center of the room a dish containing about 4 ounces of brimstone, within a larger vessel, so that the possible overflowing of the burning mass may not injure the carpet or set fire to the floor. After removing from the room all such metallic surfaces as might be affected by the fumes, close every aperture, even the keyholes, and set fire to the brimstone. When four or five hours have elapsed the room may be entered and the windows opened for a thorough airing.

The sulphur or brimstone remedy has been used very successfully by Dr. C. W. Stiles, of the Bureau of Public Health and Marine-Hospital Service, for the disinfection of frame cottages, such as those at seaside resorts, where, from neglect, infestation with bedbugs may often occur. The treatment is inexpensive compared with the use of hydrocyanic-acid gas and offers much less risk of danger to human beings. Two pounds of sulphur are recommended for each thousand cubic feet of space, and the buildings should be closed for treatment at least twenty-four hours. Sulphur candles may be used where available. The precautions indicated in the quotation from Doctor Lintner should be observed.

The fact that the bedbug has a very active enemy in the common house cockroach has already been alluded to, and the proof seems to be fairly conclusive. Another common insect visitor in houses, and a very annoying one also to the careful housekeeper—the little red ant (*Monomorium pharaonis*)—is also known to be a very active and effective enemy of the bedbug. Mr. Theo. Pergande, of this office, informs me that during the civil war, when he was in the Union army, he occupied at one time barracks at Meridian, Miss., which had been

abandoned some time before. The premises proved to be swarming with bedbugs; but very shortly afterwards the little red house ant discovered the presence of the bedbugs and came in enormous numbers, and Mr. Pergande witnessed the very interesting and pleasing sight of the bedbugs being dismembered or carried away bodily by these very minute ants, many times smaller than the bugs which they were handling so successfully. The result was that in a single day the bedbug nuisance was completely abated. The liking of red ants for bedbugs is confirmed also by a correspondent writing from Florida (F. C. M. Boggess), who goes so far as to heartily recommend the artificial introduction of the ants to abate this bug nuisance (*Insect Life*, Vol. VI, p. 340). Bedbugs and other household insects, however, are not of the sort which it is convenient or profitable to turn over to their natural enemies in the hope that eradication by this means will follow, and the fact that they are preyed upon by other insects furnishes no excuse to the housekeeper for not instituting prompt remedial measures.

Approved:

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., *January 15, 1907.*

